

range of 80 to 130°C, and therefore, no problem occurs at the time of IC chip pressure bonding in the subsequent processes. That is, the prescribed quantity of pressure can be secured at the time of pressure-bonding the IC chip, and this scarcely incur the problem that the press-cutting cannot be achieved. It is also possible to perform the semi-solidification by vaporizing only the solvent component while restraining the reaction.

When a plurality of IC chips 1 are mounted on the board 4 after the thermosetting adhesive 306b is semi-solidified as described above, the productivity is further improved by preliminarily performing the semi-solidifying process of the thermosetting adhesive 306b as a pre-arranging process in a plurality of portions which belong to the board 4 and in which the plurality of IC chips 1 are mounted, supplying the thus pre-arranged board 4 and bonding the plurality of IC chips 1 to the plurality of portions of the supplied board 4. In the subsequent processes, even when the thermosetting adhesive 306b is used, the process identical to the process employing the thermosetting resin sheet 6 of the aforementioned first or seventeenth embodiment is basically performed. By adding the semi-solidifying process, the liquid thermosetting adhesive 306b can be employed similarly to the thermosetting resin sheet 6, and this arrangement has the

advantage that the handling is easy because of the solidness and the advantage that an adhesive having a high glass transition point can be easily formed since it can be formed of polymer because of the non-existence of a liquid component. When the thermosetting adhesive 306b having fluidity is employed as described above, there is the coexistent advantage that the adhesive can be applied, printed, or transferred in an arbitrary size to arbitrary positions of the board 4 by comparison with the case where the solid thermosetting resin sheet 6 is employed.

(Nineteenth Embodiment)

A method and apparatus for mounting an electronic component of, for example, an IC chip on a circuit board and an electronic component unit or module of, for example, a semiconductor device in which the IC chip is mounted on the board by the mounting method, according to a nineteenth embodiment of the present invention will be described next with reference to Fig. 57. The nineteenth embodiment differs from the sixteenth embodiment in that the bump tip is shaped so as to prevent the short circuit with adjacent bumps or electrodes due to the collapse of a neck (whisker) portion at the tip of the bump 3 caused by the tearing-off at the time of bump formation by pressurizing the bump 3 with a load of not greater than 20 gf at need without leveling the bump 3 with supersonic waves applied in

addition to the load when the IC chip 1 is bonded to the board 4, the IC chip 1 is thereafter mounted on the board 4 while aligning in position the bump 3 with the IC chip 1, and the metal bump 3 is subjected to thermocompression-bonding with supersonic waves to the metal of the electrode surface on the board side. The state in which the IC chip 1 is bonded to the board 4 is similar to those of Fig. 39 and Fig. 43 of the aforementioned embodiments.

According to this nineteenth embodiment, the solid thermosetting resin sheet 6 or the liquid thermosetting adhesive 306b semi-solidified as described above, obtained by mixing the insulating thermosetting resin 306m with the inorganic filler 6f is stuck to the board 4 or the thermosetting adhesive 306b that contains the thermosetting resin is applied to the board 4 and semi-solidified. Thereafter, the ball 96 is formed by an electric spark at the tip of the gold wire 95 through the operation as shown in Fig. 40A through Fig. 40F similarly to the wire bonding with respect to the electrode 5 of the board 4 and the electrode 2 of the IC chip 1, and the IC chip 1 is mounted on the board 4 by aligning in position the bump 3, which is formed by thermocompression-bonding this ball 96 to the board electrode 5 with supersonic waves by means of the capillary 93, with the IC chip 1 without leveling the bump 3. In this case, the aforementioned "the